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Valuation and pricing of equity securities: A test of CAPM in a developing market economy

Sani Musa Zakirai *

Department of Economics, Saadatu Rimi University of Education Kano, Nigeria.

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Abstract

The study is on valuation and pricing of equity securities. A test of CAPM in a developing market economy (2006-2020) The major aim of the study is to investigate the capability and relevance of CAPMt to equity prices in Nigeria stock market from 2006-2020 and show if the model empirical findings are in line with results obtained from the developed markets. The model concerned in the study is Capital asset pricing model (CAPM) by Sharp 1962. from (2006-2020) Using a sample of 62 companies derived from the eleven major sectors of the Nigeria economy and Using panel data analysis and valuation status analysis results showed that, CAPM demonstrated positive and in significant impact on stock return(RI) of the Nigeria stock market. These variables do not play role on explaining the movement in the value of stock return of the selected firms within the period, The result of the relationship between actual stock return (RI) and models calculated return obtained is dominated by under valuations and over valuations with few appropriately valued stocks which are insignificant in nature, again the r2 and coefficient of determination < 1 or even negative in some cases .p value >0.05, and the result obtained in Nigeria is not the same with that of the developed economy. It is therefore recommended that, portfolio managers and other financial analysts should not adopt CAPM, as a tool to examine, explain. predict or assess accurately return of stocks traded in the Nigeria stock market.

Keywords: Pricing; Equity securities; CAPM; Stock market; Nigeria

1. Introduction

A dynamic capital market is an important segment of the financial system of any country in which it plays a significant role in mobilizing savings and channeling them for productive purposes (Al-Zubi & Salameh, 2009). The efficient fund allocation depends on the stock market efficiency in pricing the different securities that trade in it. In finance literature, the measurement of the relationship between risk and return on financial assets in pursuit of equity valuation is an important issue. According to Markowitz (1952), risk and return postures should be taking into consideration when pricing a security as the probability of realizing a return from a security is based on the level of risk inherent in the security. Consequently, a lot of studies have been conducted to test the validity of some models in explaining or predicting the variation in return. In this direction, Sharpe (1964) supported by Linter (1965) and Mossin (1966) provided CAPM. The CAPM suggests that the market beta alone is sufficient to explain stock returns. The conclusion of the CAPM is that the expected excess return [that is, $R_i - R_f$] on an asset equals the beta of the asset times the expected excess return on the market portfolio above the risk-free rate of return [that is, $R_m - R_f$]. This has dominated finance theory in equity valuation since its emergence in 1964 to date. In their own contribution, Sharpe (1964), Lintner (1965), Mossin (1966) and Black (1972) empirically showed through Capital Asset Pricing Model (CAPM) a positive relationship between the expected return and the systematic risk of a security. Osamwonyi and Asein (2012) and Ajao (2014) validated the application of CAPM by confirming a positive linear relationship between risk and market returns using the CAPM in the Nigerian Stock Exchange (NSE). But CAPM has been severally criticized for failing to explain the variance in equity returns in the developing market conditions by studies conducted in subsequent years. CAPM was

* Corresponding author: Sani Musa Zakirai

heavily criticized due to its recognition of only one risk factor. CAPM relies on a static beta, which is a correlation measure between stocks and the market. Unfortunately, historical measures of individual stocks' market correlation are fluid, so the robustness of the model is suspect. Central to this model is the idea that returns are solely dictated by systematic risk. That is, if all market participants hold similar beliefs about expected returns and the dispersion of returns, then only increases or decreases in market risk will change portfolio returns. However, market participants hold a variety of risk tolerances, time horizons, and investment constraints. This assortment of characteristics differs from the CAPM's primary tenet.Cook and Rozeff (1984), Rosenbery, Reid &Lanstein (1985) documented evidence of firm characteristics such as firm size, earnings to price ratio (E/P), book-to-market equity ratio (BE/ME), price-to-book value (P/B) and past sales growth, that were not taken into consideration by CAPM. By 1992 a number of studies had shown evidence why stock returns cannot be described solely by the one-factor CAPM. As a response to the poor performance of the CAPM, the idea to add other factors to the beta in explaining the price movements in the stock exchange became necessary. Motivated by the weaknesses and limitations of the CAPM, multiple-factor asset pricing models were developed. The Arbitrage Pricing Theory (APT) was proposed as the first multifactor successor to the CAPM by Ross (1976) without being a real success.

Valuation and pricing is very essential if not necessary in finance. It helps in providing all the necessary tools for; Merger and acquisitions, stock picking or selection, estimating market sentiment, listing of private business into stock market etc From the various methods of common stock valuation researchers have employed divergent models. Some employed single/multifactor asset pricing models while others relied on dependence of security market betas and risk adjusted discount rates against risk characteristics of cash flows. On the other hand, some employed P/E ratios in common stock valuation while others claimed that only H Model satisfied all the conditions for valuing common stock even as some assert that CAPM failed because it does not consider time variation in investment and its effect on valuation. From the extant literature it could be argued that there has been no established study on the subject matter conducted in Nigeria. From the foregoing debate, the problem this study sets to resolve is that model(s) that explain the cross-sectional returns in the Nigerian stock market has not been clearly identified. Therefore, the problem being addressed in this study is the existence of doubts on how these models can explain empirically the portfolio returns in the Nigerian stock market. The main purpose of this study is to investigate the relevance of CAPM as an asset pricing model in equity security prices in the Nigerian stock market from 2006 – 2020. The specific objectives of this study are to find if the CAPM explains cross-sectional returns of the stocks listed in the agricultural/agro-allied, banks, breweries, building materials, chemical/paints, commercial services, computer/office equipment, conglomerates, construction, food/beverages, healthcare, Oil and Gas, hotel/tourism, industrial/domestic products, packaging, marketing, printing/publishing, and the 2nd tier market, of the Nigerian Stock Exchange and to validate if the empirical findings is in line with results from developed markets.

2. Review of Related Literature

Valuation is one of the most important area of concern in financial management. Valuations are a required aspects of almost all strategic business decision to maximize shareholder value. Engaging into business activities among different countries world over in the name of internationalization, possession of production capacity and acquiring a competitor elsewhere cannot be done successfully without advocating valuations. And this is due to the increasingly global activities of multinational corporations (MNCs) and other institutions. Yet conducting a valuation across different countries is greatly challenging task and regarded as "one of the most complex issues in international financial management" (Shapiro,1999). Valuation techniques in most cases cannot stand alone rather they seek support by a well-planned approach to modeling the relevant aspects of value parameters. Estimating and validating prices are very essential to reliable valuation tools for investment attractions which leads to secure a high level of FDI, thus, it is in everybody's interest to establish trustworthy mechanisms (Gimpel, 2010). Value exists in every kind of discipline. For example, in economics, philosophy, anthropology, history and all aspects of social sciences, value exists. The concept of value should be dynamic not static that have some kind of eternal benchmark (Roche, 2017). Economists see value in terms of market price of goods and services. Anthropology utilizes the notion of value to explain dominant cultural patterns and norms. Values are used by history to describe and analyze historical events. There are numerous uses of values which makes it peculiar to all kinds of spheres of life. Therefore value has been defined in many ways. Pepper (1958) has defined value as interests, pleasures, likes, preferences, duties, moral obligations, desires, wants, needs, aversions and attractions, and many other types of selective orientation.

The noun 'value' has usually been used to imply some code or standard which persists through time and provides a criterion by which people order the intensities of desiring various desiderata. To the extent that people are able to place objects, actions, ways of life, and so on, on a continuum of approval-disapproval with some reliability, it appears that their responses to a particular desideratum are functions of culturally acquired values (William, 1980). In the world of finance, valuation plays a critical role especially in the exchange of assets. For instance, valuation is common in

corporate finance, portfolio management, as well as mergers and acquisition. Damodaran (2006) suggests that the purpose of valuation is to determine how much something is worth so that the investor does not pay more than the asset worth. He suggested that understanding assets worth and what comprises the value is vital for selecting investments for a financial portfolio as well as in investment and financial decision making. There has been a significant amount of research on valuation. The economists, Fisher (1930) and Williams (1938) were among the early scholars that produced some pieces of literature on valuation. Stowe, Robinson, Pinto, and Mc Leavey (2007) defined valuation as the estimate of an assets value based either on variables perceived to be related to future investments return or on comparison with similar assets. They outlined that valuation consists of five critical steps which include understanding the business (industry prospects, corporate strategies, and financial statements), forecasting company performance (earnings, sales, and financial forecast), choosing an appropriate valuation model, translating the forecast to valuation and finally executing the investment decision. Valuation is the analytical process of determining the current (or projected) worth of an asset or a company. For instance, security valuation is the process of determining how much a security is worth. Business valuation is the process or a set of procedures used to estimate the economic value of an owner's interest in a business for the purpose of establishing the price the buyer will pay or the owner will receive should there be need to sell the business. Valuation theory is the strategic modeling that supports the ascertainment of true and fair value of assets and businesses which are incorporated in the valuation methods (Nwude, 2020). The earnings, cash position, working capital, and market conditions of a business are always changing. The value of asset or business requires consistent and regular monitoring. This valuation principle helps business owners to understand the significance of the date of valuation in the process of business valuation.

Hitchner (2006) relates investment value and intrinsic value to valuation. According to Hitchner (2006), investment value to a particular investor is based on individual investment requirements and expectations while the intrinsic value is based on company's fundamentals. Hitchner (2006:5) states that future dividends which are derivable from earnings forecast, discounted to the present establishes the present value of the stock and that if a stock is trading for a lower price than as calculated it is a buy otherwise it is a sell. Nwude (2018) states that common stocks can be valued using two approaches namely, the fundamental and the technical analytical methods. He posits that fundamental analysis method deals with macroeconomic analysis, industry analysis and company-specific analysis in determining stock values. The three approaches considered under this method were balance sheet approaches, discounted cash flow methods and relative valuation methods. He also submits that technical analytical methods look at internal market data with the help of charts and graphs to understand what the market participants have been doing and believe it provides a basis for predicting future behavior. The technicalists believe that prices move in trends which are determined by changing attributes of investors towards variety of economic, monetary, political and psychological forces.

A survey of practitioners' evaluation methods by Bing (1971) gives insight into various approached used in practice to value equity. He sent a questionnaire to leading financial institutions to obtain specific information regarding their techniques and implied theories of equity appraisal. Out of the 34 replies, 15 were from commercial banks and 11 from mutual fund organizations. The most popular of the approaches involved the use of price to earnings. For example they compared the present actual P/E multiple with what they considered a normal multiple for the stock in question. They also compared P/E multiple and growth of earnings of individual stock with industry group multiple and earnings growth. The P/E ratio demonstrates the importance of earnings and other variables in determining security prices. It relates the price of a security to accounting information provided in published financial statements and shows their importance in security selection decision. It assumes that financial statement information is an important determinant of security prices. The main purpose of this model is to detect mispricing of capital assets.

According to Fernandez (2020b), to value shares there are two usual methods that is, if properly applied, provide the same value and they are: 1) Present value of expected free cash flows to the firm (fcff) discounted with the weighted average cost of capital (wacc) rate and then, subtract the value of debt; and 2) Present value of expected equity cash flows to equity (fcfe) discounted with the required return to equity (Ke). He claims that both valuations must provide the same result because both methods analyze the same reality under the same hypotheses; they differ only in the cash flows taken as the starting point for the valuation. But in many valuations performed by investment banks, analysts, consultants, finance professors, both methods do not provide the same value. Fuller and Hsia (1984) researched for a model that would satisfy all the four objectives of stock valuation viz, a sound conceptually model, model that requires relatively few estimates, model that allows some flexibility in describing dividend growth rate patterns, and allows straightforward calculation of either the price (given the discount rate) or the discount rate (given the price). It was noted that only H model satisfied all the conditions but would require sound estimates and required returns for its effectiveness. H Model therefore offers sound and efficient approach to stock valuation. It also allows investors to calculate security alphas (i.e difference between expected returns and required returns). Fielitz and Muller(1985**)** posit that most attractive companies have high earnings growth, high yields and high P/E ratios. Of all the approaches, CAPM

was found the most instructive since it relates returns directly to systematic risks of stocks as measured by its beta coefficient.

Equity valuation is the process of determining the fair market value of equity securities is followed differently by different individuals. As such, there is no set pre-defined standard process. However, equity valuation still has some broad categories of steps that need to be followed. The procedures maybe different but the objectives are always the same. Every person conducting equity valuation, must in one way or another account for the understanding of these parameters as described below. Firstly, no company operates in vacuum. As such, the performance of every business is influenced by the performance of the economy in general as well as the industry in which it operates. As such, before trying to value a business, the macro-economic factors must be accounted for. A reasonably accurate prediction regarding these parameters creates the base for an accurate valuation.

Thus, there is the need to understand the macroeconomic factors and the industry. Secondly, mere extrapolation of the company's current financial statements does not constitute a good forecast. A good forecast considers how the company may change its scale of production of the forthcoming future. Then, it also considers how changes in this scale will affect the costs. Costs and sales do not move in linear fashion. To come up with an accurate forecast, an analyst would require intricate knowledge of the company's business. So, there is need to factor into equity valuation a reasonable forecast of the company's performance**.** Thirdly, due to the fact that valuation is less of a science and more of an art there are multiple valuation models available which do not necessarily lead to the same conclusion. Hence, we are required to understand which model would be most appropriate given the type and quality of data available. Therefore, there is need to find out and suggest the appropriate valuation model. To arrive at a valuation figure based on the forecast we need to apply the appropriate valuation model in order to come up with an exact numerical value which defines the worth of a business or equity. It may be a single estimated amount or it could be a range but most times investors prefer a range so that they clearly know what their lower and upper bounds for bidding should be. Finally, the valuer has to give a buy, sell or hold recommendation based on the current market price and what analysis shows is the intrinsic worth of the company. It has been claimed that the process of equity valuation is thus long, subjective and difficult to understand. However, for those who do master this art, the rewards are enormous.

The theoretical framework for this study is built around CAPM by W Sharpe (1964). The Capital Asset Pricing Model (CAPM), developed by Sharpe (1964), supported by Lintner (1965), Mossin (1966) and Black (1972) states that an asset's expected return is linearly related to its beta (its measure of non-diversifiable risk), and that beta is sufficient to explain contemporaneous return differences in a sample of assets. That is, the Capital Asset Pricing Model (CAPM) expresses expected return on an asset as the sum of the return on the risk-free asset and expected premium for risk, where the risk premium is a function of the asset covariance with the market return (beta). (Rit) = R*f*+ßi (Rm*t*) - R*ft*) The risk of a stock can be decomposed into two components. The first component is the systematic risk (beta), which is related to the overall market and the second component is non-systematic risk, which is specific to the individual stock.

The fundamental premise of the CAPM is that the market will reward only the holding of systematic risk as the unsystematic risk can be diversified away by holding a diversified portfolio of assets. The beta of a firm is estimated by a time-series regression of the stock returns and market returns over a specified return interval over an estimation period. It is important to have great precision in the individual estimate of beta as large standard errors of the estimated beta not only make the estimate not so reliable but also increase uncertainty about the computation of the cost of equity of a firm and this could have unintended consequences on capital budgeting decisions of firms and broader implications at the macro-economic level. The 1997/98 Asian crisis is a case in point, where asset values collapsed in general. Among the reasons was a wrong assessment of the fundamentals, including risk (Krugman, 1998). However, researchers are confronted with an important dilemma when estimating beta: The more the observations used to estimate beta, the smaller the standard error. This improves the precision of the beta estimate but over a long period, many firms usually see a change in their structural characteristics, which changes the firm's systematic risk. Thus, if beta is not stationary, longer estimation periods may lead to better results.

In Dhaka stock exchange Bangladesh, Rahaman et al.(2006) used a sample of non-financial firms for 1999-2003, and found the stocks returns are determined not only by market beta, but also by other variables such as; firm market capitalization, firm sales, book to market value. Homsud et al.(2009) confirmed in Thailand stock market, using monthly data for 421 firms, that 3-factor model provide better explanation for stocks and Portfolios returns over CAPM.

Al-Mwalla and Karasneh (2011)tested the ability of the 3-factor model to explain the variation in stocks return for the period Jun 1999 to June 2010 in Amman stock market (ASE) and found a strong positive size and value effects as the results indicate that the 3-factor model provides better explanation to the variation in stocks returns than the CAPM.Hamid, Hanif, Malook, and Wasimullah (2012) empirically evaluate the efficacy of 3-factor model in asset pricing

and expected portfolio returns of financial sector stocks of 20 banks listed on Karachi Stock Exchange (KSE) Pakistan from January 2006 to December 2010. Multivariate regression analysis was applied on the six portfolios made on the basis of size and book to market value. Monthly data of the 20 banks were used. The findings showed that the 3-factor explained the variations in returns in most of the portfolios.

Bulla (2018) tested the efficiency of CAPM and Fama-French 3-factor model using 10 Kenyan listed banks data for period 2010-2015. Data required include stock returns, market returns, size and value factors. Their statistical power was measured by R^2 and significance of the coefficient alpha. When the bank stock data is analysed and fitted into the two models results show Fama-French 3 factor model has better fit (R^2 =77.5%) compared to CAPM (R^2 =57%). However, the value factor is irrelevant in the 3-factor model. The coefficient alpha is observed not to be different from zero signifying better efficiency for the 3-F model. Stock return is positively related with market risk (r = 0.775, p = 0.000) but negatively associated with size (r = -0.841, p=000).

Rehnby (2017) compared the capital asset pricing model (CAPM), Fama and French three factor model and Carhart´s four-factor model, to see which of these models that can explain portfolio excess returns best on the Swedish stock market because of the limited amount of research done on these models in the Swedish stock market. The results indicate that the three-factor model improves explanatory power for portfolio returns in comparison to the CAPM, and the four-factor model gives a small improvement in the explanatory power compared to the three-factor model. The results also indicate that all models have a low explanatory power when the market is volatile;

Using the equities trading in NYSE, AMEX, and NASDAQ in 1953-2001, Hu (2003) reported that the 3-factor model is more powerful in explaining the variance in equity returns in the short term than CAPM but the explanatory powers of both CAPM and 3-factor decreases in the long term. Karp and Vuuren (2017) tests the validity and accuracy of the Capital Asset Pricing Model and the Fama-French Three-Factor Model in predicting the variation in excess portfolio returns of 46 companies listed on the Johannesburg Stock Exchange (JSE) for the period 2010-2015. Portfolios of stocks were constructed based on an adapted Fama-French (1993) approach, using a 3×2 annual sorting procedure, based on Size and Book-to-Market metrics respectively. The results indicate that both models perform relatively poorly because of inadequate market proxy measures, market liquidity restrictions, unpriced risk factors and volatility inherent in an emerging market environment. The Value Premium is found to explain a larger proportion of variation in excess returns than the Size Premium, and is more pronounced in portfolios with relatively higher book-to-market portfolios

CAPM which is been founded by William sharpe in 1964 and being widely accepted and used as a predictor of stock return in the advanced countries equity market is found un able to determine the stock return of Nigerian healthcare sector stocks that coincides with the actual rates of return by Nwude and Ayunku (2013) in their empirical study captioned; Is CAPM a Good Predictor Of Stock Return In The Nigerian Healthcare Stocks? Using a secondary data obtained from the Nigeria stock exchange publications, financial statements and Central bank of Nigeria publications for the period of thirteen years (2000 – 2012) of the health care sector stocks and compares them with actual rate of return in the corresponding periods to identify the valuation status of the stocks. Result of the research show that CAPM as the adopted measure of predicting stock returns did not give any actual or for casted return of the stocks for the period under study rather it makes a total of one hundred and thirty eight misappropriations among which one hundred are over valuations while thirty are under valuations. The findings of the study concluded that CAPM as enunciated by sharp (1964) cannot be used as a tool for predicting stock return in the healthcare sector of the Nigerian stock market.

CAPM was able to estimate correctly only one banking stock return which represents 5.5 percent of the banking stocks in 2007 and 2011 respectively while, it undervalued 66.7 and 72.2 percent, overvalued 27.8 and 22.2 percent in 2007 and 2011 respectively. Other years were either undervalued or overvalued banking stocks. Hence CAPM is not a good predictor of stock return in the Nigerian banking sector. This statement is a result of an empirical finding by Nwude (2013) in a study on testing the predictive power of Capital Asset Pricing Model (CAPM) as enunciated by Sharp (1964) in the determination of the required rates of return of Nigerian banking stocks that coincides with the actual rates of return and there is no clear cut understanding on the belief with particular reference to Nigerian banking stocks. The required rate of return of Nigerian banking stocks from 2000-2011 is compared with the actual rates of return in the corresponding periods to identify the valuation status of the stocks. More over the data of the research is obtained from the company's annual reports, Central bank of Nigeria publications and the Nigeria stock exchange publications. Variables such as earnings, expected growth rates, return on equity e.t.c. are analyzed using an analytical research design in the study.

Nwude etal uses secondary data of the stocks from Nigerian breweries sector of the Nigeria stock market for a period of thirteen years (2000 – 2012) and he uses an analytical research as a tool of analyses without any modification for risk or any other country side effect measure. He further went ahead to test the predictive ability of the William sharpe's

founded CAPM in the determination of the required rate of return of the Nigerian breweries stock that can be the same with actual rate of return while his aim is to find out the required rate of return of Nigerian Breweries stocks from 2000-2012 and compare them with the actual rates of return in the corresponding periods to indentify the valuation status of the stocks. More over the data of the study is collected from the Nigerian stock exchange publications, Central bank of Nigeria publications and the annual reports of the companies for the period under study. The items gathered in this research comprises of the monthly average prices for 156 months (2000 – 2012) derived from the daily market prices of each of the subject firms' ordinary shares from 2000-2012 and retrieved from the publications of the Nigeria stock exchange. The equity price appreciation or depreciation of the subject company to compute the rates of returns of the subject-firms, from 2000-2012 which is obtained from the [publications of the central bank and the Nigeria stock exchange. The rates of returns of the market, computed from the NSE All-share Index (ASI) from 2000-2012 which is normally kept in the custody of the Nigeria stock exchange. The Nigerian Treasury Bill rates for each year from 2000-2012 to compute the risk-free rate of return retrieved from the record book of the CBN. The study revealed CAPM as adapted model in this research has failed to deliver precisely and accurately the stock return forecast in the Nigerian breweries.

Fabinu, Makinde and Folorinsho (2017) have also emphasized on CAPM which still stands as a model which is widely used for valuation of firms assets returns. Their study has looked into the correlation between the risk and expected return as measured by Beta coefficient values of 2 companies i.e London stock exchange using FSTE100 index market share price. The study again shows a higher required rate of return for Barclay (26.56%) against that of Sainsbury plc which stood at 10.72%.

Yasmin (2009) however, test the higher moment capital asset pricing model in case of Pakistan equity market. The research study do not support the standard CAPM as a model to explain the asset pricing in Pakistani stock market rather, the model was extended to incorporate the mean variance – skewness and mean – variance – skewness –Kurtosis model. They also made a second step using an auto regressive content over time which lead them to emerge with three moment CAPM and four conditional moment CAPM respectively. The data is obtained as individual stocks traded at Karachi stock exchange (KSE) for the period of ten (10) years.

Fabinho, Makinde and Folorinsho (2012) in their study on CAPM as a valuation model for firm asset return in London stock market exchange using data derived from 2 typical companies Sainsbury and Barclay plc (both of them multinational companies). They are all constituted in the FTSE100 index quoted on the London stock exchange using their share price data for the period which begins in January 2011 to December, 2015 (5 years). The companies effected operates at different sectors of the economy. The Beta values of the 2 companies are compare and summarized.

2.1. Research Gaps

It is observed from the reviewed literatures that, there is scanty literature on equity valuation in the emerging markets especially in the context of Nigerian industries. The study will try to close the gap of insufficient literature in this area. There is currently no single best practice for the valuation of assets and securities in the emerging markets, practice varies widely due to fundamental issue which attracts serious disagreements among the practitioners and here is where university institutes, professional bodies and scholarly studies can assist the development of best practice (Bruner R. F et al). At the end of my study, it will be very clear about the best method which can be applied to predict the equity security return in the Nigerian banking sector. Again, some of the studies made in this area of equity security valuations and pricing in the emerging markets are long ago despite the changes witnessed in the economy of some countries in the emerging markets including Nigeria and these changes have effected their economy directly or in directly. This study will try to bridge the gap between the previous studies and the current perspective in Nigerian stock market.

3. Methodology

3.1. Research Design

The main purpose of this study is to investigate the relevance of CAPM as an asset pricing model in equity security prices in the Nigerian stock market from 2006 – 2020. The specific objectives are to ascertain the validity of Capital asset pricing model (CAPM)) in the NSE. Based on the problem of the study, longitudinal research design is adopted for the study. The period of 2006-2020 was chosen because of availability of data. Panel data analysis method was employed to determine the validity of the models for the period. All firms whose stocks were quoted on the Nigerian Stock Exchange (NSE) between 2006 and 2020 constitute the population of the study. The population of interest for the study comprises all the equity stocks listed on the agricultural/agro-allied, banks, breweries, building materials, chemical/paints, commercial services, computer/office equipment, conglomerates, construction, food/beverages,

healthcare, hotel/tourism, industrial/domestic products, packaging, petroleum marketing, printing/publishing, and the 2nd tier market. The sample is made up of all the equity stocks listed on these sectors of the NSE with complete data availability, complete published financial statements and was traded for at least three days in every week of trading for each year from 2006 – 2020. . Specifically, the following criteria were adopted in selecting the sample of equity stocks from the population of the study. Each stock should be actively traded stocks with a minimum number of at least three trading-days per week in order to exclude the extremely thinly traded stocks. The market price per share must be above N1.00 minimum. Thus Purposive sampling technique was adopted in selecting the sample of the study as the sample was drawn from actively traded stocks based on the NSE statistics from 2006 – 2020.

The panel data used for the analysis was collected from secondary sources, the companies' annual financial statements. The share prices, book value-to-market price ratio, firm capitalization and All-share index are the variables required from the population of interest in this study. These data were obtained from the Daily official list (DOL) of the NSE and Quantum Zenith Securities and Investment limited (QZSIL) official website. Treasury bill rates were obtained from the official website of the Central Bank of Nigeria (CBN) Statistical Bulletin. This was used as a proxy for risk-free rate of return. The 90-days Nigerian government Treasury bill rates were used to obtain the monthly risk-free rate. The obtained rates were divided by 3 to enable us estimate monthly rates. Company data were obtained from the annual financial statements. Beta coefficients for equities were calculated based on historical prices of each stock and the equity market. The monthly rate of return for each stock is calculated to run the time-series test

3.2. Model specification

The Sharpe (1964) Capital Asset Pricing Model (CAPM) is a financial model, which calculates expected returns as a function of the risk-free rate, market risk, and market returns. Central to this model is the idea that returns are solely dictated by systematic risk. That is, if all market participants hold similar beliefs about expected returns and the dispersion of returns, then only increases or decreases in market risk will change portfolio returns.

The expression for the Sharpe (1964) CAPM is of the following form:

$$Rit = R_{ft} + \beta_i(R_{mt} - R_{ft}) + e_{pt}$$

Rit =monthly return to the asseti of concern at a time t

The$(R_{mt} - R_{ft})$ is the monthly return to the asset of concern in excess of the monthly t-bill rate.

The first segment of data analysis will be carried out using modular or factor status on the actual return obtained from stock return (Ri). To determine if CAPM, have overpriced, underpriced or accurately priced stock in the Nigeria stock market and the percentage obtained from each one of them. At this point again, ordinary least squire regression will be used on CAPM model to locate the coefficient of determination to test its power in predicting the cross sectional returns on stocks traded in the Nigeria stock market for the study period.

The second segment of data analysis will be carried out with a preliminary test on the data. Specifically, descriptive statistics such as mean, standard deviation, skewness, kurtosis and Jaque-Bera (JB) test were used to profile the data. Then, the data was subjected to correlation matrix and to inferential statistics. Subsequently heteroscedasticity test was done using the Durbin-Watson test for autocorrelation. The multiple Ordinary Least Square regression (OLS) technique was used for data analysis using the EView12 statistical and econometric software. This enables the regression output from the ten portfolios to be obtained in one output.

3.3. Measurements of Variables.

3.3.1. Estimation of stock return

Monthly holding period is highly recommended. The 12 monthly returns are chain–linked to obtain the annual return for each stock. Chain-linking simply means finding the geometric mean (GM) of the monthly returns thus,

$$\text{Annual return} = \text{Geometric mean (GM)} = [(1+r_1)(1+r_2)\ldots\ldots\ldots\ldots(1+rn)]^{1/n} - 1$$

It is believed that an asset that achieves a monthly geometric (ie compound) rate of return of GMi will accumulate to initial investment times $(1+GM)^n$ over n years. The estimated return represents the average return of the individual stocks over the last 13 years (2008 – 2019), likewise the market average return.

From Nwude (2018), a holding period return (HPR) $= \frac{D_t + P_t}{P_{t-1}} - 1 \equiv \frac{D_t + P_t - P_{t-1}}{P_{t-1}}$

Where

D_t = Dividend paid in period t
P_t = Closing price in period t
P_{t-1} = Beginning price in period t – 1

However, in this study, the monthly returns of the stocks were calculated by the logarithmic price change of each stock over the period of study. The monthly returns of the market were calculated by the logarithmic All-share -index change of the equity market over the period of study. According to Bundoo (2011) and Ajao (2014), these methods prevent non-stationary of the stock prices and ASI levels from affecting stock and market returns volatility respectively. This is why they are adopted in this study. They are calculated thus:

$$Rit = Ln[P_{it}/P_{it-1}]x100 \text{ or alternatively } P_0 - P_1 / P_0 \text{ where } p_0 = \text{previous day price, } P_1 = \text{current day price .on daily basis}$$

Where,

Rit = monthly return of stock i at time t
Ln = natural logarithm
P_{it} = market price of stock i at the end of the present month denoted by t
P_{it-1} = market price of stock i at the end of the immediate previous month denoted by t-1

3.3.2. Estimation of market return

The stock exchange equity composite index is usually used to compute total returns for the whole equity market over a given period. The NSE All Share Index (ASI) was used to compute total returns for the whole equity market over the study period. Growth rates in the NSE All-share index are used as the proxy for the market rate of return.

$$Rmt = Ln[ASI_t/ASI_{t-1}]x100$$

Where,

Rmt = monthly market return at time t
Ln = natural logarithm
ASI_t = Equity All-share index at the end of the present month denoted by t
ASI_{t-1} = Equity All-share index at the end of the immediate previous month denoted by t-1

3.3.3. Estimation of risk-free rate (R_f)

Goldman Sachs model working with a developed, integrated market of United States uses US Treasury bonds as the risk-free asset and S&P500 index as the market portfolio proxies (Mariscal and Lee, 1993) and this suggests that U.S. investors are expected to evaluate investments in their domestic market using such proxies. But if a U.S investor is evaluating an investment opportunity in another country outside U.S the Goldman Sachs model suggests the addition of a premium for that country risk. The country risk is measured by the spread between the yields on the country sovereign bonds and US Treasury bonds .San viccente (2015) finds that an adjustment was made for country risk, using the country sovereign bonds rate + in the 52 valuation survey reports for going-private purchase offers published by JP Morgan. Therefore, if a country's market is not sufficiently integrated into the global market, there is need to add country risk which is considered non-diversifiable by international investors (Keck, Levengood and Longfield, 1998).Nwude (2018) states that two possible approximations of risk-free rate (Rf) are either a short term, government-backed securities, such as a three-month Treasury bill, to reduce inflation risk and interest rate risk to a minimum, or a long-term government bond which matches the investor's expected holding period. This study used the 3-month Treasury Bills as a proxy for the risk-free rate of return.

3.3.4. Estimation of beta

The beta was estimated using ordinary least square (OLS).Past security returns constitute the data base most frequently used to estimate beta. The number of observations and the time interval used in the regression vary. Value line investment services used weekly rates of return for the most recent five year (260 weekly observations). Merrill lynch,

a U.S investment firm, used the most recent 60 monthly observations to estimate beta for U.S firms on the NYSE. Similarly, the London Business School Risk Measurement service used 60 most recent months observation to estimate beta for UK firms quoted on the London stock exchange. Several studies by Statman (1981) and Redly Wright (1988) that examined the relationship between value line and Merrill lynch betas found a weak relationship.

In this study 120 monthly observations are used. This study used 120 months of security returns from January 2010 to December 2019 to estimate the betas for 38 firms quoted on the Nigerian stock exchange. The raw betas obtained from the computation are adjusted to remove individual securities bias, using the Merrill lynch technique for such adjustment thus:

Adjusted Beta = 2/3 raw beta + 1/3 (1) = 0.67 (Raw beta) + 0.33 (1).

That is,

Adjusted beta = 0.67 (Raw beta) + 0.33

4. Data Presentation and Analysis

The panel data obtained from the annual reports of the sampled firms were prepared via the stated technique for each variable as established in chapter three within variable description. The stocks tested for CAPM and their sector classifications are presented in table 1 (appendix). The sectors covered in this study are the agricultural/agro-allied, banks, breweries, building materials, chemical/paints, commercial services, computer/office equipment, conglomerates, construction, food/beverages, healthcare, hotel/tourism, industrial/domestic products, packaging, petroleum marketing, printing/publishing, and the 2nd tier market. These are the classifications during the period up to 2011. From 2012, a new classification came up with eleven sectors which include agricultural/agro-allied, conglomerates, construction, consumer goods, financial institutions, healthcare, ICT, industrial goods, natural resources, petroleum marketing, and services. All the sectors were covered in this study under CAPM test except the natural resources sector which failed to meet the criteria for selection of the stocks however, other tests via 3, 4, 5 factor models are limited to only four (4) sectors namely consumer goods, industrial goods, conglomerates and oil gas. The number of stocks studied under CAPM test in each year are placed in parentheses beside each year as follows, 2006(54), 2007(56),2008(60), 2009(62), 2010(63), 2011(63),2012(62), 2013(62),2014(62), 2015(62),2016(62), 2017(62),2018(61), 2019(61), 2020(58). Other models ie 3, 4 and 5 factors utilizes only 36 stocks and from 2010 to 2019 due to the failure of the rest of the companies and the years skipped to meet the requirements of the studies. Ordinary least square regression analysis is used to examine the efficacy of CAPM in estimating the stock return.

DATA ANALYSIS: TEST OF HYPOTHESES based on valuation status and least square regression analysis.

4.1. Test of hypothesis one: CAPM

4.1.1. Step One: Restatement of Hypothesis

- Ho: The CAPM did not have significant impact on the variation in expected returns of stocks on the Nigerian Stock Exchange.
- H_1: The CAPM did have significant impact on the variation in expected returns of stocks on the Nigerian Stock Exchange.

4.1.2. CAPM Results and Valuation Status

To check yearly accuracy of CAPM return in relationship with actual stocks returns we present table 4.2.1.1 below

A stock is classified as being overvalued by CAPM if the return provided by CAPM is greater than the actual return while it is undervalued by CAPM if the return provided by CAPM is less than the actual return of the stock. It is said to be appropriately valued when the return provided by CAPM is equal to the actual return of the stock. The overvaluation is denoted by O, undervaluation is denoted by U, and accurate valuation is represented by A in the table 1 So, from the table above it could be seen that a lot of under valuations and over valuations dominated the analysis for example in 2006 402 overvaluations was recorded and very low percentage of accurate return was recorded of less than 1% in 2006. The highest accurate assessment was recorded in 2014 (22%), 2019 (21%), 2010 (20%), 2018 (20%) 2015 (19%), 2020, 2013,2011 and 2008 with 18% each. Again in all the years from 2006 – 2020 the coefficient of determination recorded very low, r^2 stood at less than 1 and even negative in some cases, means the model lack merit to predict the actual return of stocks traded in the Nigeria stock market. The table also make emphasis on the total stock

analysis of the years where the total number of 744 stock per month was analysed in majority of the years, the least amount of stocks per month was 648 in the year 2006 thus, the study cover virtually all the stock of the Nigeria firms listed in the Nigeria stock market who satisfy the requirements of the study.

Table 1 CAPM percentage of accuracy and coefficient of determination per year

		Number of stocks	Number of months	Number of stock months	O	U	A	TOTAL	% of A	R	R^2
1	2006	54	12	648	402	248	3	653	0.46	0.09209	0.008481
2	2007	56	12	672	251	324	86	661	13.01	-0.09389	0.008815
3	2008	60	12	720	297	272	127	696	18.25	0.217828	0.047449
4	2009	62	12	744	323	292	131	746	17.56	-0.01433	0.000205
5	2010	63	12	756	299	301	158	758	20.84	0.297423	0.088461
6	2011	63	12	756	372	247	142	761	18.66	0.353519	0.124975
7	2012	62	12	744	406	280	58	744	7.80	0.06202	0.003847
8	2013	62	12	744	263	342	140	745	18.79	-0.53396	0.285109
9	2014	62	12	744	323	250	170	743	22.88	0.146782	0.021545
10	2015	62	12	744	351	247	145	743	19.52	0.272647	0.074337
11	2016	62	12	744	364	286	96	746	12.87	0.223994	0.050173
12	2017	62	12	744	430	257	61	748	8.16	0.444834	0.197877
13	2018	61	12	732	345	234	153	732	20.90	0.494686	0.244714
14	2019	61	12	732	331	244	155	730	21.23	0.097205	0.009449
15	2020	58	12	696	296	273	129	698	18.48	0.457957	0.209724

Total assessment of CAPM accuracy in predicting each stock return from 2006-2020: To check the total accuracy of CAPM in predicting each stock returns for the study period we present table 4.2.1.3 below.

Table 2 Data set

	2006-2020	O	U	A	TOTAL	%OF A
1	LSF	93	66	21	180	0.116667
2	Okomu	75	73	32	180	0.177778
3	Presco	77	78	25	180	0.138889
4	Access	80	90	10	180	0.055556
5	Fbn	90	72	18	180	0.1
6	Fcmb	92	75	13	180	0.072222
7	Fidelity	83	74	23	180	0.127778
8	Gtco	62	95	23	180	0.127778
9	Stanbic	69	88	23	180	0.127778
10	Sterling	87	73	20	180	0.111111
11	Uba	93	86	19	180	0.09596
12	Ubn	93	63	24	180	0.133333

13	Unity	98	58	24	180	0.133333
14	Wema	89	66	25	180	0.138889
15	Zenith	73	90	17	180	0.094444
16	Guinness	94	74	12	180	0.066667
17	IB	87	64	29	180	0.161111
18	NB	77	87	16	180	0.088889
19	Buacem	96	79	5	180	0.027778
20	Dancem	70	87	23	180	0.127778
21	Lafarge	76	85	19	180	0.105556
22	Berger paints	91	68	21	180	0.116667
23	Cap	81	73	26	180	0.144444
24	Meyer	85	41	54	180	0.3
25	Transexp	96	43	41	180	0.227778
26	NCR	67	27	86	180	0.477778
27	Tripple Gee	71	19	90	180	0.5
28	PZ	79	87	14	180	0.077778
29	UAC	86	82	12	180	0.066667
30	Unilever	78	86	16	180	0.088889
31	JB	94	71	15	180	0.083333
32	cadbury	93	73	14	180	0.07778
33	FMN	81	80	19	180	0.10556
34	NNFM	93	35	52	180	0.28889
35	Nestle	76	85	19	180	0.10556
36	GSK	87	74	19	180	0.10556
37	M&B	96	69	15	180	0.08333
38	Neimeth	103	67	10	180	0.05556
39	NGC	70	16	94	180	0.52222
40	Tourist	55	12	77	144	0.53472
41	BOC Gases	28	22	22	72	0.30556
42	Vitafoam	78	86	16	180	0.08889
43	Beta Glass	78	57	45	180	0.25000
44	Ardova	89	69	22	180	0.12222
45	Conoil	89	64	27	180	0.15000
46	Eterna	86	69	25	180	0.138889
47	Mobil	86	74	20	180	0.111111
48	Mrs	82	45	53	180	0.294444
49	Oando	85	78	17	180	0.094444
50	Total	82	73	25	180	0.138889

51	Academy	93	38	49	180	0.272222
52	LearnAfrica	80	80	20	180	0.111111
53	UniPress	83	76	21	180	0.116667
54	Cutix	84	84	12	180	0.066667
55	Danflour	9	3	0	12	0.000000
56	HNYW	64	57	11	132	0.083333
57	DanSugar	62	69	13	144	0.090278
58	Capital Hotel	56	15	61	132	0.462121
59	IkejaHotel	77	47	20	144	0.138889
60	Interlinked	45	6	93	144	0.645833
61	Fidson	53	74	17	144	0.118056
62	Nahco	90	63	15	168	0.089286
63	Transcorp	67	63	16	146	0.109589
64	Redstar	71	54	19	144	0.131944
	Total	**5053**	**4097**	**1754**	**10886**	**10.42223**

Source; Researcher 2023

Table 2 indicates the relationship in percentage between CAPM and actual return to see the percentage of the appropriately valued stock returns from 2006 to 2020. From all the assessment CAPM ha not perform well in predicting the stock return as shown by the low percentage of A (Appropriate) valued whereas the ret of valuation figures is either under valuation or over valuations with higher percentage. To our surprise CAPM as a model could not even provide up to 10% accuracy in its predictions. The predictions are more of under valuations and over valuations. For example it is only the tock of Total company which have recorded value above 10% accuracy through out the years of the study, which is insignificant.

4.2. Decision

From the analysis above, the null hypothesis (Ho) is accepted, entailing that CAPM model did not have significant effect on ACTUAL RETURN of the selected firms in Nigeria from 2006 - 2020 as accurate valuation (A) is only 10% and coefficient of determination is very low.

5. Discussion

To determine the effect of the CAPM 2006 -2020 First, the results showed that CAPM demonstrated positive and insignificant effect on actual return (RI) and these variables play a weak role on explaining part of the movement in the value of market return of the selected firms within the period. Again results from valuation status analysis, indicate the existence of pricing patterns which are unique to individual stocks. For the entire sample period, returns from CAPM and actual returns exhibit significant differentials. For the sub-period before 2008 financial crisis, the entire stocks exhibit no significant effects of CAPM. The returns from CAPM are significantly lower than those of the actual returns. However, post-2008; this effect vanishes for all the stocks except for 2009 which again shows the incapacitated power of CAPM to explain any variations even small indicated by the $r^2$of 0.000 and since then the rest of the years have shown very little effort of the model to predict the actual returns. At the financial crises period CAPM has done a little better than the past for example in 2010, the r^2 was 0.088, 2011 is 0.123 while in 2012 the performance was below the preceding 2 years 0.004 indicating no variation. The little performance of CAPM is observed to be oscillating between the years indicated by the r^2 for example in 2013 it was 0.285 and fall to 0.022 in 2014 and rise to 0.074 in 2015. In 2016 the performance of CAPM using r^2 fall to 0.046 and rise to 0.198 in 2017 and increase to 0.245 in 2018. In the covid 19 year the performance fall down to 0.009 worst than many years ago but rise to 0.209 in the year 2020 however, CAPM from these analysis can not be fin pointed as a model which predict returns of equity traded in the Nigeria stock exchange for these years hence it can not explain significant variation of the market performance..

The result obtained from the regression model indicates that CAPM had negative and insignificant impact on market return. With negative and insignificant effect market return, it follows that CAPM model has less ability in predicting stock return and a bad indicator of stock pricing models. CAPM is not a good models in determining the variation in stock return in the Nigeria stock market. The finding is also consistent with the works of Nwude and Eyisi (2013), Pereiro (2006)Allen and Cleary (1998) among others.

6. Conclusion ad Recommendatios

The study examined the valuation and pricing of equity securities: A test of CAPM in a developing market economy (2006 – 2020). After carrying out the necessary diagnostics test, the study employed FEM (PLS) at the end GLS was employed to examine the study hypotheses, and valuation status. CAPM had insignificant impact on stock return in the agricultural/agro-allied, banks, breweries, building materials, chemical/paints, commercial services, computer/office equipment, conglomerates, construction, food/beverages, healthcare, hotel/tourism, industrial/domestic products, packaging, petroleum marketing, printing/publishing, sectors and the 2nd tier market and the result obtained from the study had not been in line with studies in the developed markets .It is recommended that CAPM as a model should not be considered by investors to predict return on stocks listed traded in the agro-allied, banks, breweries, building materials, chemical/paints, commercial services, computer/office equipment, conglomerates, construction, food/beverages, healthcare, hotel/tourism, industrial/domestic products, packaging, petroleum marketing printing/publishing, sectors and the 2nd tier market of the Nigeria stock exchange as it only emphasized on overvaluations and under valuations with little accurately valued.

Compliance with ethical standards

Disclosure of conflict of interest

There is no conflict of interest associated with this paper.

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